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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/624,038	07/21/2003	Young-Kai Chen	28-19-3-3	6373

22046 7590 10/30/2008

DOCKET ADMINISTRATOR
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EXAMINER	
LEE, EUGENE	
ART UNIT	**PAPER NUMBER**
2815	

MAIL DATE	DELIVERY MODE
10/30/2008	PAPER

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte YOUNG-KAI CHEN, ROSE FASANO KOPF,
WEI-JER SUNG, and NILS GUENTER WEIMANN

Appeal 2008-4240
Application 10/624,038
Technology Center 2800

Decided: October 29, 2008

Before MAHSHID D. SAADAT, JOHN A. JEFFERY, and CARLA M. KRIVAK, *Administrative Patent Judges*.

JEFFERY, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from the Examiner's rejection of claims 8, 10, 12-14, 16-19, 22, 25, and 29-31. We have jurisdiction under 35 U.S.C. § 6(b). We reverse.

STATEMENT OF THE CASE

Appellants invented an integrated circuit (IC) comprising thin film bipolar transistors that include semiconductive layers for emitter, base, and collector that are disposed in a vertical arrangement. With this vertical configuration, the semiconductor of the base layer at least partially surrounds the topmost active layer of the bipolar transistor that promotes heat dissipation and a more planar cross-sectional profile.[1] Claim 8 is illustrative:

8. An integrated circuit, comprising:

a substrate having a top surface;

collector, base, and emitter semiconductor layers of a bipolar transistor, the semiconductor layers forming a vertical sequence on the substrate in which intrinsic portions of two of the semiconductor layers are sandwiched between the top surface of the substrate and a remaining top one of the semiconductor layers, the base layer comprising an extrinsic portion that laterally encircles a vertical portion of the top one of the semiconductor layers; and

a dielectric sidewall being interposed between the vertical portion of the top one of the semiconductor layers and the extrinsic portion of the base layer; and

wherein the substrate includes a subcollector that forms an electrical contact for the collector layer, the entire subcollector being located outside of the portion of the substrate that is vertically below part of the base layer.

The Examiner relies on the following prior art references to show unpatentability:

König	US 5,096,844	Mar. 17, 1992

[1] *See generally* Spec. 1:5-2:19.

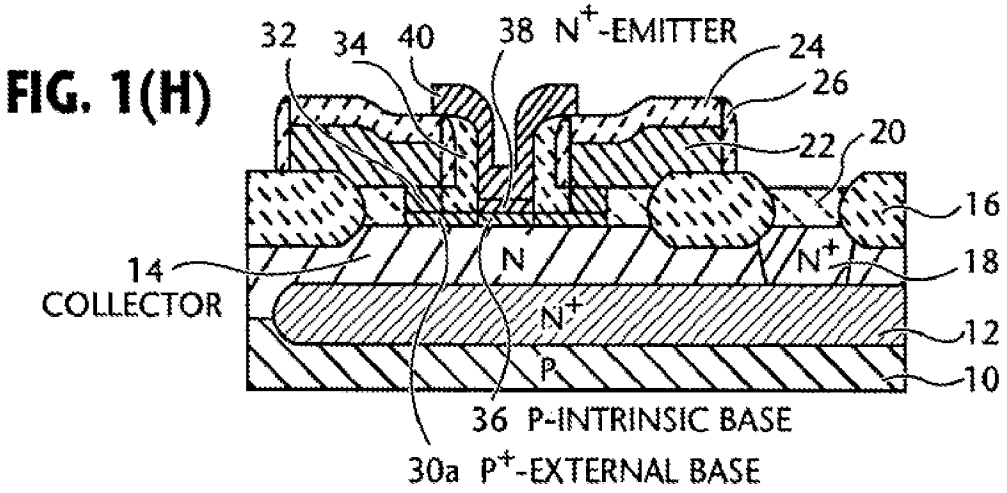
Wang	US 5,444,003	Aug. 22, 1995
Imai	US 5,506,427	Apr. 9, 1996
Malik	US 6,541,346 B2	Apr. 1, 2003

1. Claims 8, 10, 12-14, 16, 22, and 25 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Imai (Ans. 3-4).
2. Claim 17 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Imai and Wang (Ans. 5).
3. Claims 18, 19, 29, and 30 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Imai and Malik (Ans. 5-6).
4. Claim 31 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Imai, Malik, and Konig (Ans. 6).

Rather than repeat the arguments of Appellants or the Examiner, we refer to the Briefs and the Answer for their respective details. In this decision, we have considered only those arguments actually made by Appellants. Arguments which Appellants could have made but did not make in the Briefs have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii).

The Anticipation Rejection

We first consider the Examiner's anticipation rejection of claims 8, 10, 12-14, 16, 22, and 25 over Imai. The Examiner refers to various aspects of the bipolar transistor structure illustrated in Figure 1(H) of Imai as fully meeting the recited limitations of independent claim 8 (Ans. 3-4). This figure is reproduced below for clarity:



Reproduction of Figure 1(H) of Imai

The dispute in this appeal turns on one recited feature of independent claim 8: the "subcollector." The Examiner interprets this feature as corresponding to the N^+ layer 18 in Imai. Appellants argue that layer 18 cannot be a subcollector as claimed since it is not below the collector 14 (App. Br. 4-5). The Examiner, however, contends that the term "subcollector" is not limited to this interpretation. According to the Examiner, in light of the definition of the prefix "sub," a subcollector can be reasonably interpreted as merely a subordinate portion or subdivision of the collector (Ans. 8-9).

Appellants respond that even if this interpretation were acceptable, layer 18 would still not satisfy other limitations of claim 8 that specifically call for, among other things, (1) the collector, base, and emitter layers to form a vertical sequence *on* the substrate, and (2) the substrate to *include* the subcollector. These limitations, Appellants argue, require the subcollector to be below the collector layer (Reply Br. 4-5).

ISSUES

The issues before us, then, are whether Appellants have shown that the Examiner erred in (1) interpreting the recited subcollector as corresponding to layer 18 of Imai, and (2) if this interpretation is reasonable, then whether the disputed limitations of claim 8 are otherwise anticipated by Imai, namely that the collector, base, and emitter layers in Imai form a vertical sequence *on* the substrate, and the substrate *includes* the subcollector.

FINDINGS OF FACT

The record supports the following findings of fact (FF) by a preponderance of the evidence:

1. As shown in Figure 1(H), Imai discloses a heterojunction bipolar transistor that comprises, in pertinent part, a substrate 10 on which is formed an N-type silicon collector layer 14, N^+-type buried layer 12, N^+ collector pull-up layer 18 formed by ion implantation, P^+-type base layer 30a, and an N^+-type emitter layer (Imai, col. 3, l. 1-col. 4, l. 17; Figs. 1(A)-1(H)). *See* Figure 1(H) reproduced above.

2. The collector pull-up layer 18 is adjacent to, and coplanar with, collector 14 (Imai, Fig. 1(H)).

PRINCIPLES OF LAW

Anticipation is established only when a single prior art reference discloses, expressly or under the principles of inherency, each and every element of a claimed invention as well as disclosing structure which is capable of performing the recited functional limitations. *RCA Corp. v. Appl.*

Dig. Data Sys., Inc., 730 F.2d 1440, 1444 (Fed. Cir. 1984); *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1554 (Fed. Cir. 1983).

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. *See In re Fine*, 837 F.2d 1071, 1073 (Fed. Cir. 1988). In so doing, the Examiner must make the factual determinations set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966).

If the Examiner's burden is met, the burden then shifts to the Appellants to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. *See In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992).

ANALYSIS

We are persuaded of error in the Examiner's anticipation rejection of independent claim 8. While we agree with the Examiner (Ans. 8-9) that, absent any further limitations dictating the location of a subcollector, a subcollector need not be disposed below a collector. Indeed, the Examiner's point that a subcollector could be a subordinate part of or subdivision of the collector is well taken. As such, we agree with the Examiner that the collector-pull up layer 18 in Imai reasonably constitutes a "subcollector" since it is adjacent to the collector layer 14 and essentially functions as a conductor with respect to the collector in view of the pull-up layer's doping as Appellants indicate (Reply Br. 4) (FF 1).

But we find that Imai nonetheless fails to anticipate claim 8 which calls for, in pertinent part, that the collector, base, and emitter layers form a vertical sequence *on* the substrate -- a substrate that *includes* a subcollector.

Turning to Imai, the collector pull-up layer 18 is formed by ion implantation (FF 1). Although Imai does not implicitly identify the layer in which the ion implantation is performed for layer 18, Figure 1(H) shows epitaxial layer 14 as a continuous layer extending to where the implanted region 18 is formed. Therefore, we conclude that layer 18 is not included in the substrate.

To construe the "substrate" in Imai as comprising layers 10, 12, and 18 as the Examiner proposes (Ans. 3) simply strains reasonable limits. First, the Examiner's construction runs counter to the reference itself which identifies only layer 10 as the substrate (FF 1). That said, however, we can envision layers 10 and 12 together functioning as a "substrate" at least with respect to the layers located above such a "substrate" (e.g., collector 14, collector pull-up layer 18, etc.). In that sense, the collector, base, and emitter layers would form a vertical sequence on this "substrate" similar to the substrate 10.

But the Examiner includes collector pull-up layer 18 as part of this "substrate"—a layer that is located *above* layers 10 and 12—yet excludes the collector layer 14 that is coplanar with the pull-up layer (FF 1, 2). However, Imai's collector pull-up layer 18 is formed in the collector epitaxy, not in the substrate.

Accordingly, we find that Imai fails to disclose a substrate that *includes* a subcollector such that a collector is disposed *on* this substrate in a vertical sequence as claimed in independent claim 8.

For the foregoing reasons, Appellants have persuaded us of error in the Examiner's rejection of independent claim 8. Therefore, we will not sustain the Examiner's rejection of that claim, and dependent claims 10, 12-14, 16, 22, and 25 for similar reasons.

The Obviousness Rejections

Regarding the obviousness rejections of (1) claim 17 over Imai and Wang; (2) claims 18, 19, 29, and 30 over Imai and Malik; and (3) claim 31 over Imai, Malik, and Konig, since we find that the disclosures of the additional cited references do not cure the deficiencies noted above of Imai with respect to independent claim 8, we will also not sustain the obviousness rejections for similar reasons.

CONCLUSIONS OF LAW

Appellants have shown that the Examiner erred in finding Imai anticipates 8, 10, 12-14, 16, 22, and 25 under § 102. Appellants have likewise shown that the Examiner erred in rejecting claims 17-19 and 29-31 under § 103.

DECISION

The Examiner's decision rejecting claims 8, 10, 12-14, 16-19, 22, 25, and 29-31 is reversed.

REVERSED

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